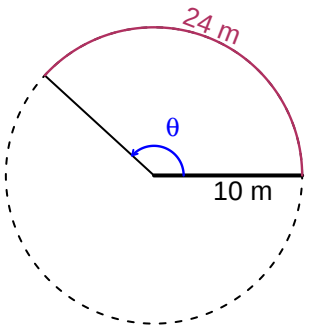
Name: Date:

Trig Final (SLTN v691)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 10 meters. The arc length is 24 meters. What is the angle measure in radians?

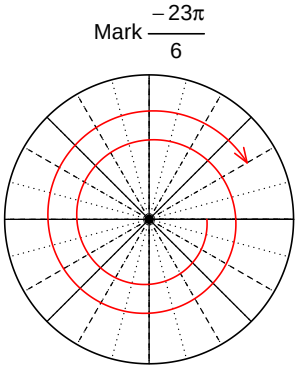


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

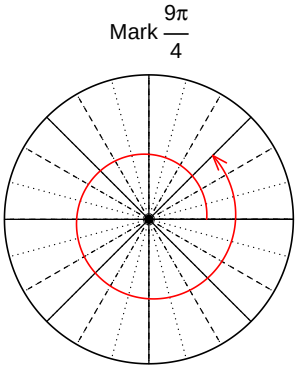
$\theta = 2.4$ radians.

Question 2

Consider angles $\frac{-23\pi}{6}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-23\pi}{6}\right)$ and $\sin\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-23\pi/6)$



Find $\sin(9\pi/4)$

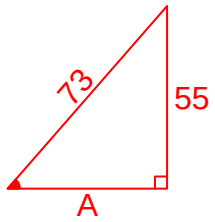
$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-55}{73}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

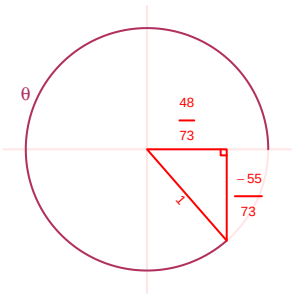
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 55^2 = 73^2$$
$$A = \sqrt{73^2 - 55^2}$$
$$A = 48$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-55}{73}}{\frac{48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 2.02$ meters, an amplitude of 5.65 meters, and a frequency of 8.3 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.65\sin(2\pi 8.3t) + 2.02$$

or

$$y = -5.65\sin(16.6\pi t) + 2.02$$

or

$$y = -5.65\sin(52.15t) + 2.02$$